Method for stocking and preserving green round wood and sawn timber

The invention relates to a method for stocking and preserving green round wood and sawn timber, of both softwood and hardwood, over long periods without loss of quality.

Conventional general preserving methods concern mainly food which is sterilized by heating in the absence of air (bottling, canning), or fumigated in dry condition with carbon dioxide (protection of grain from pests), or gassed with protective gases having special compositions (storing and ripening of fruit in a nitrogen/carbon dioxide atmosphere), or cleared from insects under pure nitrogen (restoration of wood articles whose pigments would be attacked by carbon dioxide).

Methods used so far for preserving green round wood are based on storage in water or sprinkling with water. A wood moisture content of over 100% is aimed at in order to prevent fungal growth. Drawbacks are the high water consumption and the ground-water pollution due to wood substances, in connection with different moisture content in the interior of the wood stack, which results in fungal attack (Armillariella species).

Further, round wood and sawn timber can be preserved for a time using insecticides and fungicides. The application of pesticides involves endangering nature and mankind.

A safe method of preservation is to convert and season the wood as soon as possible. This, however, demands extensive conversion and seasoning capacities to be kept in reserve, in order to be capable of quickly processing large quantities of round wood (wind-fallen wood and other problems).

Also known are attempts to preserve green round wood in dry stacks. This method, however, involves high risks of fungal and insect attacks.

From DE-OS 28 57 355 and DE-OS 34 34 551, methods are known of influencing the wood properties by means of fungal cultures.

According to DE-OS 28 57 355, a method is known of microbiologically modifying softwood using micro-organisms. These micro-organisms selectively modify the softwood whereby the temperature, the moisture content of the wood, the O_2 content and the CO_2 content are controlled in due consideration of the micro-organisms.

In DE-OS 34 34 551, the round wood is deliberately discoloured by treatment with wood-destroying fungi. Discoloration occurs at those places where the fungus culture has been applied. Also the application of several fungus cultures is described which is associated with a beneficial boundary layer formation.

In the paper ~~AFZ 19/1992~~, pp. 1024–1025, experiments are reported to preserve wood using a protective gas. In these experiments wood with standardized dimensions was wrapped in silo films. The stacks were fumigated with both nitrogen and carbon dioxide; in each case, the threefold gas volume compared to the wood volume was required. Thereby the oxygen content was reduced to 4–5 % and this content maintained over a longer period of time (more than 6 months). After opening of the stack a fungal coating was found on the wood that is assumed to be an antagonist, which indicates that an attack from wood-destroying fungi can be prevented by the promotion of antagonistic fungi.
Disadvantages are the fumigating demand described and the relatively high residual oxygen content.

It is the objective of this invention to develop a method that enables to stock green round wood or sawn timber of all wood species over a longer period of time without deterioration of quality and strength properties without previously having the wood sterilized, moistened, dried or treated with special protective gases.

The problem is solved using features given by Claim 1. The subclaims present advantageous developments of the invention.

Initially, it is certainly surprising that humid, non-debarked wood is not going mouldy and not rotting under a low-exchange atmosphere. Essential to the invention, however, is that resulting from the metabolic processes of fungi, bacteria, ~~as well as respiratory processes of wood cells still alive~~ which have been fed into the covering through the green round wood, or sawn timber, respectively, a virtually oxygen-free atmosphere, enriched with carbon dioxide, is produced.

Contrary to the interpretation in ~~AFZ 19/1992~~, pp. 1024–1025, it is not the action of the fungal antagonists which is decisive to prevent wood-destroying fungi from growth. It is rather the very low oxygen content of less than 0.1 vol.-% that is essential for permanent storage possibility.

This low oxygen content is achieved by the fact that after the respiratory processes as in fruit storing in which CO_2 and H_2O are released and which end with the consumption of the O_2, another cycle starts. In this cycle, fermentation processes occur in that additional CO_2 is set free so that the CO_2 content further rises.

The initiation of fermentation processes is another substantial advantage of the invention, compared to fruit storage. No degradation of cellulose or lignin takes place while only readily soluble sugars are degradated. Thus the strength of the round wood or timber, respectively, is remained.

~~The biotechnological process started after the sealing from air can be accelerated by minimization of the volume of the air within the cover.~~

In order to produce sealing from air, covering, advantageously a plastic film with a high diffusion resistance, is employed. To reduce the danger of leakage the film can be used in double layer. The benefit of a flexible covering consists in that the volume of the air can be minimized (by suction until the film tightly wraps the stack of wood or timber).

Sealing from air can also be obtained in purpose-prepared storehouses, containers, cargo holds, lined pits, silos, or mining tunnels.

After any short-time opening of the air-tight covering to take out some wood, or timber, respectively, the virtually oxygen-free atmosphere after re-sealing reproduces within a few days. The micro-organisms are able, independent of the time of the year, to reproduce those conditions that are favourable for them.
Additionally, CO_2 stored in the wood as a porous body and solved in the water bonded in the wood, can again be released to produce a new gas balance.

In film storage, sealing from air of the wood or timber stacks, in case of valuable (veneer) wood also of individual trunks, is achieved by a double weld at the enveloping film, or by gluing, respectively, or by clamping of the films webs straight lying on top of each other by means of strips of wood around which the film is tightly wrapped and secured with clips from unwinding.

The essential advantage of the method according to the invention consists in that the preservation storage needs no additional fumigation.

In the following, further details of the invention will be disclosed by several examples of embodiment. By means of the accompanying drawings it is shown by:

Fig. 1 an arrangement of several round logs with welded, or bonded, respectively, double film encapsulation

Fig. 2 an arrangement of one round log with welded, or bonded, respectively, double film encapsulation

Fig. 3 a clamping device at the film edges

Fig. 4 a diagram showing the gas development during storage under sealing from air

Fig. 5 a diagram showing the bending strength during the storage process after storing under oxygen withdrawal with zero sample and DIN value.

Example of embodiment 1

Double-layered dualene films were spread on a plane surface and 30 m³ of non-debarked spruce, diameter classes 15–25 cm, were placed on them. Two measuring flexible tubes were laid out in the stack and attached to the film using bulkhead fittings. According to Fig. 1, the projecting film was then drawn over the stack and both films–separate from each other–welded by a double weld seam. After about 3 days in summer, about 10 days in winter, the oxygen content reduces to under 0.1 %. The carbon dioxide content levels off at about 40 % (see Fig. 4). After a storage period of 24 months neither blue stain, nor red stripes, nor growth of Armillariella species could be detected. The bending strengths measured to DIN 52186 were not lower than those for green comparison samples (compare Fig. 5).

Example of embodiment 2

1 m³ of pine timber was enveloped with double dualene film, as in Fig. 2. Both film edges were clamped between strips and tightly wound around these strips. The composite thereby produced was secured from unwinding using clips. In this way, the conditions for adjustment of the gas atmosphere can be created without any weld seam using means available on the site.

Example of embodiment 3

According to Fig. 3, a maple veneer trunk of 35 cm centre diameter, 3 m length, was wrapped in double-layered dualene film. Near to either butt end of the trunk, a bulkhead fitting is attached. Then the films were doubly welded. After 2 weeks an atmosphere has established that contains less than 0.1% oxygen and whose carbon dioxide content is up to 30%.

Example of embodiment 4

In order to make overseas transportation possible of green round wood without damage, the wood is stacked in airtight-sealed holds, filling the hold space as completely as possible. As the holds can already be sealed water-tightly using bulkheads, sealing from air needs be produced only on the top using air-tight or sealed hatches. In order to reduce the adjustment time, exhaust gases of the ship's diesel engine are piped to the hold as initial fumigation.